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[TITLE OF THE INVENTION] Crawler Frame for Construction Machine

[CLAIMS]

[claim 1] A crawler frame for a construction machine having a center frame and right and left track frames disposed on the right and left sides of the center frame so as to extend in a back and forth direction,

wherein legs for connecting said center frame and said track frames are made of cast steel.

[claim 2] The crawler frame according to claim 1,

wherein the legs of the center frame have a tubular shape and the top faces of the legs are convex in cross-section.

[claim 3] The crawler frame according to claim 1,

wherein the legs of the center frame are in the shape of a cylindrical pipe having a circular cross-section.

[claim 4] The crawler frame according to claim 1, 2 or 3,

wherein the legs joined to the track frames are each gradually widened toward an end, having a joint flange section at the end.

[claim 5] The crawler frame according to claim 1, 2, 3 or 4

wherein joint flange surfaces of the legs and the center frame and/or joint flange surfaces of the legs and the track frames are flat faces.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[TECHNICAL FIELD TO WHICH THE INVENTION BELONGS]

The present invention relates to a crawler frame for a construction machine and more particularly to a crawler frame well suited for use in the undercarriage of a hydraulic excavator or the like.

[0002]

[PRIOR ART]

The following patent publications are the prior art of the present invention.

[Patent Literature 1]

Japanese Unexamined Published Application No. 11-93209

[Patent Literature 2]

Japanese Unexamined Published Application No. 8-72615

[Patent Literature 3]

Japanese Unexamined Published Application No. 2000-230252

[0003]

There has been known a turnable material handling vehicle such as a hydraulic excavator, wherein a crawler travel system including right and left rotatable crawlers (caterpillars) is employed and this crawler travel system has a track frame (which corresponds to the crawler frame of the present application) as a system body.

Such a track frame for a turnable material handling vehicle generally includes a center frame and a right and left pair of side frames (which correspond to the track frames of the present application). This center frame has, at its center, a swing bearing with a ring gear for rotatably supporting a revolving frame on which an excavating system (excavating implement), cabin, engine, bonnet and others are mounted. The side frames are coupled to the right and left ends, respectively, of the center frame so as to extend in a back and forth direction. Provided at the front and rear ends of the side frames are idlers and drive wheels around which the crawlers are wound respectively.

In the prior art, for stably sustaining the load of the upper structure, four coupling legs, in total, formed by sheet-metal welding of a steel plate are provided at the four corners of the center frame as a means for coupling the center frame and side frames of the track frame. Also, a frame structure is employed which assumes a substantially H-shape or X-shape in plan on the whole (see the above patent literatures 1, 2, 3).

[0004]

The center frame having a swing bearing at the center thereof is coupled to the side frames with substantially H-shaped coupling legs formed by sheet-metal welding of a steel plate or the like. The underside of the central plate section corresponding to a bedplate on which the swing bearing is mounted is supported by front and rear vertical walls; a central vertical wall section; vertical side wall sections which are connected to this, extending to the side frames; and a right and left pair of coupling vertical wall sections etc. so as to directly sustain the load imposed on the swing bearing. Additionally, an upper coupling plate and a lower coupling plate are welded to the upper and

lower ends of these vertical wall sections, respectively.

The upper coupling plate is comparatively wide in the back and forth direction and constituted by a flat plate which extends to the right and left side frames. Therefore, flying and penetrating mud is likely to adhere to and deposit on the top face of the upper coupling plate as excavating and carrying operation by a construction machine such as a hydraulic excavator proceeds, although the upper coupling plate is more or less inclined toward the right and left side frames (see the above patent literature 1).

The center frame having a swing bearing at the center thereof is coupled to the side frames with substantially H-shaped coupling legs formed from a steel plate or the like. The member on which the swing bearing is mounted is a round body located at the center of the center frame. The load imposed on the swing bearing is directly sustained by the round body located at the center and four legs extending to the right and left side frames are secured by welding to the round body.

The four legs are formed from appropriate vertical sheet members in order to sustain the load imposed on the swing bearing. Since the top face of each leg is constituted by a flat steel plate relatively moderately inclining toward one of the side frames, flying and penetrating mud is likely to adhere to and deposit on the top face (see the above patent literature 2).

Further, the center frame having a swing bearing at the center thereof is coupled to the side frames with substantially X-shaped coupling legs formed by sheet metal welding of a steel plate or the like. In the center frame, the bed plate on which the swing bearing is mounted is supported by right and left side vertical members, a front vertical member and a rear vertical member, and the load imposed on the swing bearing is directly sustained by these vertical members. Covering boards are welded to the upper ends and lower ends of these vertical members thereby forming four legs in a continuous fashion so as to extend to the right and left side frames.

The top face of each leg in this publication is also constituted by a flat steel plate which relatively moderately inclines toward one of the side frames so that flying and penetrating mud is likely to adhere to and deposit on the top face (see the above patent literature 3).

[0005]

[THE PROBLEMS TO BE SOLVED BY THE INVENTION]

In the above center frames, coupling of the right and left track frames (which correspond to the side frames of the above patent literatures 1 to 3) is done by four legs which are formed by sheet metal welding of a steel plate or the like. For this reason, the steel plates or the like used for forming the four legs have various shapes so that complicated blank layout is involved and the number of members increases.

In addition, many processes such as laying-out, cutting, bending and welding are involved, and many welding places as well as complicated weld lines make the number of welding processes increase, resulting in increased manufacturing time and manufacturing cost.

Further, the center frame has rightwardly extending legs and leftwardly extending legs which are coupled to the right and left track frames (corresponding to the side frames) and the top faces of these legs are formed from flat steel plates relatively moderately inclining to the track frames, so that mud which flies and penetrates into the center frame during the excavating/carrying operation of the hydraulic excavator or during traveling of the hydraulic excavator adheres to and deposits on the top faces of the legs in large quantity.

The adhered and deposited mud will penetrate into the swing bearing with a ring gear positioned at the center of the upper part of the center frame and could be a cause of damage to the swing bearing.

Further, the mud which has adhered to and deposited on the legs moves to the top faces of the tracker frames (corresponding to the side frames) and accumulates there, and this accumulated mud could be an obstacle to the rotation of the upper tracker rollers or a cause of lopsided wear of the upper tracker rollers.

The accumulated mud is removed by washing which, however, needs a lot of water for removal and many washing processes, resulting in increased cleaning cost.

In addition, a large amount of mud is left in the washing site after washing so that the liveries who rent construction machines such as hydraulic excavators have the problem of mud disposal.

[0006]

The present invention has been directed to overcoming the foregoing problems and a primary object of the invention is therefore to provide a crawler frame for use in a construction machine, which crawler frame is easily manufactured, less susceptible to mud adhesion/deposition, and easily washed, because the legs of the center frame connected to the track frames are made of cast steel.

[0007]

[MEANS FOR SOLVING THE PROBLEMS]

The above object can be accomplished by a crawler frame for a construction machine according to the invention, which has a center frame and right and left track frames disposed on the right and left sides of the center frame so as to extend in a back and forth direction, wherein legs for connecting said center frame and said track frames are made of cast steel.

In this case, the legs of the center frame have a tubular shape and the top faces of the legs are convex in cross-section.

The legs of the center frame are in the form of a cylindrical pipe having a circular cross-section.

The legs joined to the track frames are each gradually widened toward an end, having a joint flange section at the end.

Joint flange surfaces of the legs and the center frame and/or joint flange surfaces of the legs and the track frames are flat faces.

[0008]

[WORKING EFFECTS]

In the crawler frame for a construction machine according to the invention, since the legs for connecting the center frame to the track frames are formed from cast steel, it is unnecessary to connect the center frame to the track frames by use of four legs formed by sheet metal welding of a steel plate etc. like the prior art which involves many processes. Additionally, since welding is required for the joint surfaces of the central frame section of the center frame and the legs and for the joint surfaces of the legs and the inner side wall faces of the track frames only, the number of welding places can be reduced and welding can be easily carried out, resulting in a significant reduction in the number of processes and processing time.

In addition, since the legs are formed from cast steel, their thickness

can be easily varied according to the load of the upper structure or the like imposed on the legs and, therefore, the internal stress of the legs can be made substantially uniform. For example, the portion of each leg which is located on the side of the track frame and subjected to great internal stress may be made thick and thickness is gradually reduced toward the leg portion on the side of the center frame section. With this arrangement, the weight of the centre frame can be reduced compared to the conventional center frames made from sheet metal.

Since the legs for connecting the center frame to the track frames are formed from cast steel, the manufacture of the crawler frame can be extremely facilitated.

[0009]

In the crawler frame for a construction machine according to the invention, the legs of the center frame have a tubular shape and the top faces of the legs are convex in cross-section. Since the top faces of the legs are convex, if mud flies onto or penetrates to the top faces of the legs, the mud will easily drop to the ground without adhering and depositing.

Even if flying and penetrating mud adheres to the convex portions of the top faces of the legs more or less, the adhering mud will be easily shaken off to the ground by vibration or the like occurring at the time of traveling, before it dries and anchors to the top faces.

As a result, no mud adheres to and deposits on the convex portions of the top faces of the legs. Even if mud deposits on the top faces, its amount is negligible.

Even if mud happens to adhere, it can be easily washed down to the ground by cleaning, thanks to the tubular shape of the legs with a convex top face.

Since there is no or little mud adhering to and depositing on the legs, there is no chance for mud to reach and penetrate to the swing bearing, giving damage thereto.

In addition, since there is no or little mud adhering to and depositing on the legs, the amount of water required for cleaning is small and the number of cleaning processes as well as the cleaning cost can be reduced.

Further, the amount of mud left in the washing site after washing is very

small so that the problem of mud disposal imposed on the livery or the like can be alleviated.

[0010]

In the crawler frame for a construction machine according to the invention, the legs of the center frame are in the form of a cylindrical pipe having a circular cross-section. Therefore, even if mud flies onto or penetrates to the top faces of the legs, adhering thereto, the mud will easily drop to the ground because the top faces of the legs are in the shape of a circular cylindrical pipe.

Compared to the tubular legs having top faces which are convex in cross-section, the legs in the shape of a cylindrical pipe having a circular cross section is somewhat less effective, but most of the mud coming to the legs will drop to the ground without adhering and depositing substantially similarly.

When making the legs from cast steel, they can be relatively easily produced because the legs are in the shape of a cylindrical pipe having a circular cross-section.

[0011]

In the crawler frame for a construction machine according to the invention, the legs joined to the track frames are each formed so as to be gradually widened toward an end, having a joint flange section at the end. This makes the stress imposed on the track frame side of the legs substantially equal to the stress imposed on the center frame inner side of the legs. Note that the track frame side is subjected to great internal stress (bending stress, shearing stress) caused by the load of the upper machinery etc. which works on the center frame.

Thereby, the weight of the centre frame can be reduced, compared to the conventional center frames which are made from sheet metal and the thickness of which is determined depending on the maximum stress.

In addition, a joint flange section is formed at the joint end of each leg which is joined to its corresponding track frame. Since the joint flange section is located in the distal end of the gradually widened leg, it has large area, so that the welding strength of the leg and the track frame can be increased.

[0012]

In the crawler frame for a construction machine according to the

invention, the joint flange faces of the legs and the center frame and/or the joint flange faces of the legs and the track frames are flat faces. Therefore, machining of the weld faces can be extremely facilitated and in addition, weld faces of high precision and strength can be attained in spite of easy welding.

Whichever the joint surfaces of the legs and the center frame and the joint surfaces of the legs and the track frames are both made to be flat faces or either of them is made to be flat faces, the corresponding effect can be acquired.

[0013]

[EMBODIMENTS OF THE INVENTION]

Referring now to the drawings, there will be described the crawler frame for a construction machine of the invention.

In the following description, those parts that are substantially equivalent to or function substantially similarly to one another are given the same part names and reference numerals and a repetitive explanation will be omitted.

First, reference is made to Figures 1 to 5 to describe a crawler frame for a construction machine according to a first embodiment of the invention.

Figure 1 is an outside perspective view of the crawler frame for a construction machine according to the first embodiment of the invention. Figure 2 is a front view of the crawler frame for a construction machine according to the first embodiment of the invention. Figure 3 is exploded views of a central frame section of a center frame provided for the crawler frame for a construction machine of the first embodiment of the invention. Figure 4 is an outside side view of a leg of the center frame provided for the crawler frame for a construction machine of the first embodiment of the invention. Figure 5 is a diagrammatical plan view of the crawler frame for a construction machine according to the first embodiment of the invention.

[0014]

In Figures 1, 2, a crawler frame 1 is used for a turnable material handling vehicle such as a hydraulic excavator and incorporated in a crawler travel system having right and left rotatable crawlers (caterpillars).

In the following description, like the examples of the prior art, the traveling direction of the turnable material handling vehicle such as a hydraulic excavator is referred to as "back and forth direction (the longitudinal direction of

the track frames 5R, 5L) and the lateral direction orthogonal to the back and forth direction is referred to as "sideways direction (the direction orthogonal to the longitudinal direction of the track frames 5R, 5L).

[0015]

In Figures 1, 2, the crawler frame 1 is comprised of a center frame 3 and track frames 5 (5L , 5R) which are located at the left and right, respectively, of the center frame 3.

The center frame 3 is comprised of a central frame section 7 and a left leg 9L and a right leg 9R which are formed from cast steel and secured to the left and right side vertical face plates (described later), respectively, of the central frame section 7.

The central frame section 7 is arranged and has the shape such as shown in Figures 2, 3 and formed from a material such as a steel plate.

The central frame section 7 includes an upper member 7a shown in Figure 3(a), a lower member 7b shown in Figure 3(c) and a vertical member 7c which is shown in Figure 3(b) and connects the upper member 7a to the lower member 7b.

[0016]

The outer shape of the upper member 7a is hexagonal. Defined within the upper member 7a is a hexagonal aperture 8 into which swivel joints or pipes (not shown) are inserted.

The vertical member 7c is formed by bending a relatively long flat sheet material such as a steel plate into the shape of a hexagon from which the vertical face plate corresponding to the bottom is eliminated.

By bending a flat plate such as a relatively long steel plate into a shape of hexagon from which a bottom vertical face plate is eliminated, a left side vertical face plate 13L parallel to the left track frame 5L is formed at the left end and a right side vertical face plate 13R parallel to the right track frame 5R is formed at the right end.

The lower member 7b is formed into a hexagonal shape and the end portion corresponding to the bottom of the hexagon is bent thereby to form a front side vertical face plate 7H having the same height as the left and right side vertical face plates 13L, 13R of the vertical member 7c.

The upper end of the front side vertical face plate 7H is brought into

contact with the underside (shown in the drawings) of the upper member 7a for welding.

The upper member 7a, the lower member 7b and the vertical member 7c are integrated by welding, thereby forming a hollow box of hexagonal-prismatic shape.

Although the outer shape of the upper member 7a shown in Figure 3 is hexagonal, the central frame section 7 may be made by forming the upper member 7a into a pentagonal shape as shown in Figure 8 (described later) and forming the lower member 7b and the vertical member 7c so as to fit the pentagonal upper member 7a.

[0017]

Secured to the top face of the upper member 7a of the central frame section 7 is a fixing bedplate 11 for fixing a swing bearing with a ring gear 10 placed thereon.

The left and right side vertical face plates 13L, 13R of the vertical member 7c are constituted by flat faces parallel to the inner side wall faces of the left and right track frames 5L, 5R, respectively. The left leg 9L formed from cast steel and the right leg 9R formed from case steel are secured to the left and right side vertical face plates 13L, 13R respectively, by welding.

The central frame section 7 and the fixing bedplate 11 may be integrally formed from cast steel.

[0018]

Referring to Figures 1, 2 and 4, the left leg 9L formed from cast steel has, at its inner end, a joint flange section 15S securely welded to the left side vertical face plate 13L of the central frame section. A front leg section 15F and rear leg section 15B of the left leg 9L extend outwardly from the joint flange section 15S to the left track frame 5L positioned at the lower left. The front and rear leg sections 15F, 15B have, at their outer ends, joint flange sections 17F, 17B respectively.

The joint flange sections 17F, 17B are joined and secured by welding to the inner side wall face of the left track frame.

In addition, the right leg 9R formed from cast steel has, at its inner end, a joint flange section 15S secured by welding to the right side vertical face plate 13R of the central frame section 7. A front leg section 15F and rear leg section

15B of the right leg 9R extend outwardly from the joint flange section 15S to the right track frame 5R positioned at the lower right.

The front and rear leg sections 15F, 15B have, at their outer ends, joint flange sections 17F, 17B respectively. The joint flange sections 17F, 17B are joined and secured by welding to the inner side wall face of the right track frame.

The front and rear legs 15F, 15B of the left leg 9L and the front and rear legs 15F, 15B of the right leg 9R have the same cross-sectional shape as the cross-section taken along line A-A of Figure 2.

The left and right legs 9L, 9R shown in Figure 4 are in the shape of a triangular tube with an upper face of convex cross-section.

The front and rear legs 15F, 15B of the left and right legs 9L, 9R which are formed from cast steel are formed by a tubular die having a thickness (t) as shown in Figure 2.

The joint surfaces 9a of the joint flange sections 15S, which are located at the inner ends of the left and right legs 9L, 9R and secured by welding to the left and right side vertical face plates 13L, 13R of the central frame section 7 are preferably flat faces. Also, the joint surfaces 9b of the joint flange sections 17F, 17B, which are positioned at the outer ends of the left and right legs 9L, 9R and secured by welding to the inner side wall faces of the right and left track frames 5L, 5R, may be flat faces.

[0019]

In Figure 5, the crawler frame 1 has the center frame 3 and the track frame 5 composed of 5R, 5L disposed on the right and left sides of the center frame 3.

The center frame 3 is constituted by the central frame section 7; and the left leg 9L and the right leg 9R which are formed from cast steel and secured to the left and right side vertical face plates of the central frame section 7.

The swing bearing with a ring gear 10 is seated on the fixed bedplate 11 on the central frame section 7.

The joint flange section 15S located at the inner end of the left leg 9L made of cast steel is securely welded to the left side vertical face plate 13L of the central frame section 7. The front and rear legs 15F, 15B of the left leg 9L extend outwardly from the joint flange section 15S toward the left track frame 5L

located at the lower left of the joint flange section 15S, gradually inclining downward so as to describe an arc. The joint flange sections 17F, 17B disposed at the outer ends of the front and rear legs 15F, 15B of the left leg 9L are joined and secured by welding to the inner side wall face of the left track frame 5L.

The front and rear legs 15F, 15B of the left leg 9L and the left track frame 5L define a relatively large left hole 19L.

The joint flange section 15S located at the inner end of the right leg 9R made of cast steel is securely welded to the right side vertical face plate 13R of the central frame section. The front and rear legs 15F, 15B of the right leg 9R extend outwardly from the joint flange section 15S toward the right track frame 5R located at the lower left of the joint flange section 15S, gradually inclining downward so as to describe an arc. The joint flange sections 17F, 17B disposed at the outer ends of the front and rear legs 15F, 15B of the right leg 9R are joined and secured by welding to the inner side wall face of the right track frame 5R.

The front and rear legs 15F, 15B of the right leg 9R and the right track frame 5R define a relatively large right hole 19R.

As shown in the plan view of Figure 5, the center frame 3 is formed in the shape of substantially X by the left leg 9L and the right leg 9R which are made of cast steel.

[0020]

The front and rear legs 15F, 15B of each of the left and right legs 9L, 9R made of cast steel are formed so as to be apart from each other with the joint flange section 17F located at the outer end of the front leg 15F being at a more forward position and the joint flange section 17B located at the outer end of the rear leg 15B being at a more rearward position. With this arrangement, the central frame section 7 takes a substantially X shape that is suited for sustaining the load of the upper machinery and others imposed on the central frame section 7.

In the above explanation, there has been described a case where the front and rear legs 15F, 15B of the left and right legs 9L, 9R formed from cast steel extend from their associated joint flange sections 15S outwardly to the left and right track frames 5L, 5R located at the lower left and lower right, gradually

downwardly inclining in an arc, and the joint flange sections 17F, 17B at the outer ends are secured by welding to the inner side wall faces of the left and right track frames 5L, 5R. An alternative is such that the front and rear leg sections 15F, 15B extend to the right and left track frames 5R, 5L, gradually downwardly inclining in linear form, and the joint flange sections 17F, 17B at the outer ends are joined to and secured by welding to the inner side wall faces of the left and right track frames 5L, 5R.

[0021]

With reference to Figures 6(a) to 6(e), there will be explained the sectional form of the legs of the center frame provided for the crawler frame for a construction machine according to each embodiment of the invention.

Figure 6 is sectional views of various legs which respectively have a tubular shape and a top face of convex cross-section; and sectional views of legs which respectively have a cylindrical pipe shape and a circular cross-section.

In order to prevent mud from adhering to and depositing on the crawler frame for a construction machine, it is necessary to contemplate what sectional form is suited for the legs which are formed from cast steel and provided for the center frame of the crawler frame. Figures 6(a) to 6(e) show examples of legs which have a tubular shape and a top face of convex cross-section in order to prevent adhesion and deposition of mud on the upper faces of the legs and shows examples of legs which have a cylindrical pipe shape and a circular cross-section in order to prevent adhesion and deposition of mud on the upper faces of the legs.

[0022]

Figs. 6(a) to 6(e) are sectional views of the left and right legs 9L, 9R taken along line A-A of Figure 2.

Figure 6(a) shows the tubular form 20a of a leg having a top face of convex cross-section and this tubular form 20a is an equilateral-triangle; Figure 6(b) shows the tubular form 20b of a leg having a top face of convex cross-section and this tubular form 20b is in the shape of a relatively high isosceles-triangle; Figure 6(c) shows the tubular form 20c of a leg having a top face of convex cross-section and this tubular form 20c is in the shape of a relatively low isosceles-triangle; and Figure 6(d) shows the tubular form 20d of

a leg having a top face of convex cross-section and this tubular form 20d is oval.

While Figures 6(a) to 6(d) show three tubular legs of triangular cross-section and one tubular leg of oval cross-section as examples of the sectional form of the legs formed from cast steel, there are other examples of tubular forms with a top face of convex cross-section. For example, pentagonal and hexagonal shapes may be employed.

It should be noted that the top face of any of these legs has a convex cross-section.

In the cases of tubular legs of triangular, pentagonal and hexagonal cross-sections, the inner face and outer face of the tubular legs should be rounded at the corners in order to avoid stress concentration.

[0023]

Figure 6(e) shows the cylindrical pipe-like form 20e of a leg having circular section.

Even if mud flies onto or penetrates to the top face of the leg, adhering to the top face, the mud is unlikely to accumulate and gradually drops onto the ground thanks to the cylindrical pipe-like shape of the leg with the round top face.

In view of the effect of preventing adhesion/deposition of mud, the leg 20e shown in Figure 6(e) is somewhat inferior to the legs shown in Figures 6(a) to 6(d), but it is true that mud is unlikely to adhere to and deposit on the leg shown in Figure 6(e) to the substantially same degree as those of the legs shown in Figures 6(a) to 6(d).

In addition, since the leg shown in Figure 6(e) is in the shape of a cylindrical pipe having a circular cross-section, even if mud adheres to and deposits on it, the amount of it is negligible.

Further, the leg shown in Figure 6(e) is relatively easy to manufacture because it is formed in the shape 20e of a cylindrical pipe having a circular cross-section.

[0024]

Next, reference is made to Figure 7 to describe a crawler frame for a construction machine according to a second embodiment of the invention.

Figure 7 is a diagrammatical plan view of the crawler frame for a

construction machine according to the second embodiment of the invention.

In Figure 7, a crawler frame 1A has a center frame 3A and the track frames 5 (5L, 5R) disposed at the right and left of the center frame 3A.

The center frame 3A includes the central frame section 7 and a left leg 9AL and right leg 9AR which are formed from cast steel and secured to the left and right side vertical face plates, respectively, of the central frame section 7.

Mounted on the fixed bedplate 11 of the central frame section 7 is the swing bearing with a ring gear 10.

Secured to the left side vertical face plate 13L of the central frame section 7 by welding is the joint flange section 15S provided at the inner end of the left leg 9AL formed from cast steel. The front leg section 15F and rear leg section 15B of the left leg 9AL extend from the joint flange section 15S outwardly toward the left track frame 5L located at the lower left, gradually downwardly inclining in an arc. The joint flange sections 17F, 17B provided at the outer ends of the front and rear leg sections 15F, 15B of the left leg 9AL are joined to and secured by welding to the inner side wall face of the left track frame 5L.

Secured to the right side vertical face plate 13R of the central frame section 7 by welding is the joint flange section 15S provided at the inner end of the right leg 9AR formed from cast steel. The front leg section 15F and rear leg section 15B of the right leg 9AR extend from the joint flange section 15S outwardly toward the right track frame 5R located at the lower right, gradually downwardly inclining in an arc. The joint flange sections 17F, 17B provided at the outer ends of the front and rear leg sections 15F, 15B of the right leg 9AR are joined to and secured by welding to the inner side wall face of the right track frame 5R.

[0025]

As described above, the joint flange section 15S located at the inner end of the left leg 9AL made of cast steel is securely welded to the left side vertical face plate 13L of the central frame section 7. The front and rear legs 15F, 15B of the left leg 9AL extend outwardly from the joint flange section 15S toward the left track frame 5L, gradually inclining downward so as to describe an arc. The joint flange sections 17F, 17B disposed at the outer ends of the front and rear legs 15F, 15B of the left leg 9AL are joined and secured by

welding to the inner side wall face of the left track frame 5L. And, the front leg section 15F and rear leg section 15B are respectively gradually widened toward their respective ends, forming a tapered shape 9d.

Formed at the ends of the front and rear leg sections 15F, 15B having the gentle tapered shape 9d are the joint flange sections 17F, 17B.

Thereby, when securing the joint flange sections 17F, 17B provided at the outer ends of the front and rear leg sections 15F, 15B of the left leg 9AL to the inner side wall face of the left track frame 5L by welding, larger weld area can be ensured for the joint flange sections 17F, 17B so that the strength of the weld established between the leg and the track frame can be increased.

[0026]

As described earlier, the joint flange section 15S provided at the inner end of the right leg 9AR formed from cast steel is secured by welding to the right side vertical face plate 13R of the central frame section 7. The front leg section 15F and rear leg section 15B of the right leg 9AR extend from the joint flange section 15S toward the right track frame 5R, gradually downwardly inclining in an arc. The joint flange sections 17F, 17B provided at the outer ends of the front and rear leg sections 15F, 15B of the right leg 9AR are joined to and secured by welding to the inner side wall face of the right track frame 5R. And, the front leg section 15F and rear leg section 15B are respectively gradually widened toward their respective ends, forming a tapered shape 9d.

Formed at the ends of the front and rear leg sections 15F, 15B each having the gentle tapered shape 9d are the joint flange sections 17F, 17B.

Thereby, when securing the joint flange sections 17F, 17B provided at the outer ends of the front and rear leg sections 15F, 15B of the leg 9AR to the inner side wall face of the right track frame 5R by welding, larger weld area can be ensured for the joint flange sections 17F, 17B so that the strength of the weld established between the leg and the track frame can be increased.

By gradually widening and curving the front and rear leg sections 15F, 15B of the left and right legs 9AL, 9AR towards their respective ends, larger weld area can be ensured for the joint flange sections 17F, 17B and stress concentration on the widened portions of the front and rear leg sections 15F, 15B of the left and right legs 9AL, 9AR can be prevented.

In view of the concept of the technique of the invention, the crawler

frame 1A shown in Figure 7 inevitably assumes X form.

[0027]

Next, reference is made to Figure 8 to describe a crawler frame for a construction machine according to a third embodiment of the invention.

Figure 8 is a diagrammatical plan view of the crawler frame for a construction machine according to the third embodiment of the invention.

In Figure 8, a crawler frame 1B has a center frame 3B and the track frames 5 (5R, 5L) disposed at the right and left sides of the center frame 3B.

The center frame 3B includes a central frame section 7A and a right leg 9BR and left leg 9BL which are formed from cast steel and secured to the right and left side vertical face plates of the central frame section 7A.

Mounted on the fixing bedplate 11 of the central frame section 7A is the swing bearing with a ring gear 10.

The central frame section 7A shown in Figure 8 is pentagonal in shape. Its manufacturing method is the same as of Figure 3 except that the upper member 7a has a pentagonal shape instead of a hexagonal shape.

The width (the length in the lateral direction) of the central frame section 7A is greater in the front part than in the rear part when viewed in the traveling direction.

More specifically, the planes of the left and right side vertical face plates 13L, 13R of the central frame section 7A inwardly incline at an angle of $\theta/2$ from the front side toward the rear side so that the central frame 7A is tapered down with the width (the length in the lateral direction) of the front side being greater than that of the rear side.

Secured, by welding, to the left side vertical face plate 13L of the central frame section 7A which inclines at an angle of $\theta/2$ is the joint flange section 15S provided at the inner end of the left leg 9BL formed from cast steel. The front leg section 15F and rear leg section 15B of the left leg 9BL extend from the joint flange section 15S outwardly toward the left track frame 5L located at the lower left, gradually downwardly inclining in an arc. The joint flange sections 17F, 17B provided at the outer ends of the front and rear leg sections 15F, 15B of the left leg 9BL are joined to and secured by welding to the inner side wall face of the left track frame 5L.

[0028]

Secured, by welding, to the right side vertical face plate 13R of the central frame section 7A which inclines at an angle of θ/2 is the joint flange section 15S provided at the inner end of the right leg 9BR formed from cast steel. The front leg section 15F and rear leg section 15B of the right leg 9BR extend from the joint flange section 15S outwardly toward the right track frame 5R located at the lower right, gradually downwardly inclining in an arc. The joint flange sections 17F, 17B located at the outer ends of the front and rear leg sections 15F, 15B of the right leg 9BR are joined to and secured by welding to the inner side wall face of the right track frame 5R.

The left and right track frames 5L, 5R are aligned in a direction orthogonal to the sideways direction of the construction machine and disposed in parallel with each other at a specified distance apart.

The joint flange sections 17F, 17B disposed at the outer ends of the front leg section 15F and rear leg section 15B of the left leg 9BL are formed in parallel with the left track frame 5L and the joint flange sections 17F, 17B disposed at the outer ends of the front leg section 15F and rear leg section 15B of the right leg 9BR are formed in parallel with the right track frame 5R.

Thus, the central frame section 7A is wide at its front side and narrow at its rear side; the planes of the left and right side vertical face plates 13L, 13R of the central frame section 7A incline at an angle of θ/2 from the front side toward the rear side; and the joint flange sections 15S disposed at the inner ends of the left and right legs 9BL, 9BR are secured by welding to the inclining faces of the left and right side vertical face plates 13L, 13R, respectively, of the central frame section 7A, whereby various stresses imposed on the central frame section 7A by the heavy load of the upper structure etc. can be steadily sustained.

[0029]

For coupling the central frame section 7A to the left and right track frames 5L, 5R through the joint flange sections 17F, 17B disposed at the outer ends of the left and right legs 9BL, 9BR, the joint flange sections 17F, 17B at the outer ends of the left and right legs 9BL, 9BR are first welded to the flat inner side wall faces of the right and left track frames beforehand, and then, the left and right legs 9BL, 9BR are interposed between the central frame section 7A and the track frames such that the spacing between the left and right legs 9BL,

9BR is kept to a specified value Y along the area extending from the front side to the rear side in the traveling direction, and the central frame section 7A is pushed in the direction W shown in Figure 8.

With this arrangement, the clearance U between the central frame section 7A and the right and left legs 9BR, 9BL can be made to be zero so that not only welding can be easily carried out but also weld strength can be ensured and, in addition, the number of welding processes can be reduced.

Although the central frame section 7A of the center frame 3B is pentagonal in shape in Figure 8, it may have a hexagonal shape.

As far as the left and right side vertical face plates 13L, 13R of the pentagonal or hexagonal central frame section 7A are flat faces, other sides may be curved.

[0030]

Next, reference is made to Figure 9 to describe a crawler frame for a construction machine according to a fourth embodiment of the invention.

Figure 9 is a diagrammatical plan view of the crawler frame for a construction machine according to the fourth embodiment of the invention.

In Figure 9, a crawler frame 1C has a center frame 3C and the track frames 5 (5L, 5R) disposed at the left and right sides of the center frame 3C.

The center frame 3C includes the central frame section 7 and a front left leg 21L, a rear left leg 23L, a front right leg 21R and a rear right leg 23R which are formed from cast steel and secured to the left and right side vertical face plates of the central frame section 7.

Mounted on the fixed bedplate 11 of the central frame section 7 is the swing bearing with a ring gear 10.

Secured, by welding, to the left side vertical face plate 13L of the central frame section 7 are joint flange sections 27a provided at the inner ends of the front and rear left legs 21L, 23L formed from cast steel. A leg section 25 constituting the front left leg 21L and a leg section 25 constituting the rear left leg 23L extend from their associated joint flange sections 27a outwardly toward the left track frame 5L located at the lower left, gradually downwardly inclining in an arc. Joint flange sections 27b provided at the outer ends of the leg sections 25 of the front left leg 21L and the rear left leg 23L are joined to and secured by welding to the inner side wall face of the left track frame 5L.

[0031]

Secured, by welding, to the right side vertical face plate 13R of the central frame section 7 are joint flange sections 27a provided at the inner ends of the front and rear right legs 21R, 23R formed from cast steel. A leg section 25 constituting the front right leg 21R and a leg section 25 constituting the rear right leg 23R extend from their associated joint flange sections 27a outwardly toward the right track frame 5R located at the lower right, gradually downwardly inclining in an arc. Joint flange sections 27b disposed at the outer ends of the front right leg 21R and the rear right leg 23R are joined to and secured by welding to the inner side wall face of the right track frame 5R.

As described earlier, the front right leg 21L, rear right leg 23L, front right leg 21R and rear right leg 23R formed from cast steel have, at their respective inner ends, the joint flange sections 27a which are joined to and securely welded to the left and right side vertical face plates 13L, 13R of the central frame section 7, and the leg sections 25 of these legs have, at their outer ends, joint flange sections 27b which are joined to and secured by welding to the inner side wall faces of the right and left track frames.

In the crawler frame 1C of the fourth embodiment, the central frame section 7 is supported on and coupled to the right and left track frames 5R, 5L by means of four legs formed from cast steel, that is, the front left leg 21L, the rear left leg 23R, the front right leg 21R, the rear right leg 23R, etc.

[0032]

As described above, the joint flange sections 27a located at the inner ends of the front left leg 21L and the rear left leg 23L made of cast steel are securely welded to the left side vertical face plate 13L of the central frame section 7. The leg sections 25 of the front left leg 21L and the rear left leg 23L extend outwardly from there toward the left track frame 5L, gradually inclining downward in an arc. The joint flange sections 27b disposed at the outer ends of the leg sections 25 of the front left leg 21L and the rear left leg 23L are joined and secured by welding to the inner side wall face of the left track frame 5L. And, the leg sections 25 of the front left leg 21L and the rear left leg 23L are respectively gradually widened toward their respective ends, forming a tapered shape 9d.

Formed at the ends of the leg sections 25 of the front left leg 21L and

the rear left leg 23L having the gentle tapered shape 9d are the joint flange sections 27b.

With this arrangement, when securing the joint flange sections 27b provided at the outer ends of the front and rear left legs 21L, 23L to the inner side wall face of the left track frame 5L by welding, larger weld area can be ensured for the joint flange sections 27b so that the strength of the weld established between the legs and the track frame can be increased.

[0033]

As described above, the joint flange sections 27a located at the inner end of the front right leg 21R and the rear right leg 23R made of cast steel are securely welded to the right side vertical face plate 13R of the central frame section 7. The leg sections 25 of the front right leg 21R and the rear right leg 23R extend outwardly from there toward the right track frame 5R, gradually inclining downward in an arc. The joint flange sections 27b disposed at the outer ends of the leg sections 25 of the front right leg 21R and the rear right leg 23R are joined and secured by welding to the inner side wall face of the right track frame 5R. And, the leg sections 25 of the front right leg 21R and the rear right leg 23R are respectively gradually widened toward their respective ends, forming a tapered shape 9d.

Formed at the ends of the leg sections 25 of the front right leg 21R and the rear right leg 23R having the gentle tapered shape 9d are the joint flange sections 27b.

With this arrangement, when securing the joint flange sections 27b provided at the outer ends of the front and rear right legs 21R, 23R to the inner side wall face of the right track frame 5R by welding, larger weld area can be ensured for the joint flange sections 27b so that the strength of the weld established between the legs and the track frame can be increased.

By gradually widening and curving the leg sections 25 of the front and rear left legs 21L, 23L and the front and rear right legs 21R, 23R towards their respective in gentle tapered shape, larger weld area can be ensured for the joint flange sections 27b and the concentration of stress on the leg sections 25 of the front and rear left legs 21L, 23L and the front and rear right legs 21R, 23R can be prevented.

In view of the concept of the technique of the invention, the crawler

frame 1C shown in Figure 9 inevitably assumes the form of X.

[0034]

Next, reference is made to Figure 10 to describe a crawler frame for a construction machine according to a fifth embodiment of the invention.

Figure 10 is a diagrammatical plan view of the crawler frame for a construction machine according to the fifth embodiment of the invention.

In Figure 10, a crawler frame 1D has a center frame 3D and the track frames 5 (5R, 5L) disposed at the right and left sides of the center frame 3D.

The center frame 3D includes the central frame section 7 and a right leg 29R and left leg 29L which are formed from cast steel and secured to the right and left side vertical face plates of the central frame section 7.

Mounted on the fixed bedplate 11 of the central frame section 7 is the swing bearing with a ring gear 10.

Secured, by welding, to the left side vertical face plate 13L of the central frame section 7 is a joint flange section 37 which is provided at the inner end of the left leg 29L formed from cast steel. A front leg section 31 and rear leg section 33 of the left leg 29L extend from the joint flange section 37 outwardly toward the track frame 5L located at the lower left, gradually downwardly inclining in an arc. An integral joint flange section 38 provided at the outer ends of the front leg section 31 and rear leg section 33 of the left leg 29L is joined to and secured by welding to the inner side wall face of the left track frame 5L.

[0035]

Secured, by welding, to the right side vertical face plate 13R of the central frame section 7 is a joint flange section 37 which is provided at the inner end of the right leg 29R formed from cast steel. A front leg section 31 and rear leg section 33 of the right leg 29R extend from the joint flange section 37 outwardly toward the track frame 5R located at the lower right, gradually downwardly inclining in an arc. An integral joint flange section 38 provided at the other ends of the front leg section 31 and rear leg section 33 of the right leg 29R is joined to and secured by welding to the inner side wall face of the right track frame 5R.

The left leg 29L and the right leg 29R formed from cast steel are integral with the joint flange sections 37 at the inner ends of the legs which are securely

welded to the left and right side vertical face plates 13L, 13R of the central frame section 7 and with the joint flange sections 38 which are provided at the outer ends of the front and rear leg sections 31, 33 of the left leg 29L securely welded to the inner side wall faces of the left and right track frames 5L, 5R.

Although the crawler frame 1D for a construction machine according to the fifth embodiment shown in Figure 10 assumes the shape of H, it may be formed in the shape of X by spacing the outer ends of the front leg section 31 and rear leg section 33 of each leg apart in the back and forth direction and coupling the spaced ends by use of the integral joint flange section 38.

[0036]

Next, the crawler frame for a construction machine of the invention will be explained according to the first to fifth embodiments with reference to the drawings. More particularly, there will be explained the joint flange face between each leg and the center frame and/or the joint flange face between each leg and its associated track frame.

According to the crawler frame for a construction machine of the embodiments of the invention, since the joint surfaces of the joint flange sections at the inner ends of the legs and the center frame and/or the joint surfaces of the joint flange sections at the outer ends of the legs and the track frames are flat faces, machining of the weld surfaces can be markedly facilitated and, moreover, high-precision high-strength weld surfaces can be attained in spite of easy welding.

First, an explanation will be made referring to Figures 5 and 7.

According to Figure 5 showing the first embodiment and Figure 7 (the reference numerals of this figure are omitted) showing the second embodiment, the joint flange sections 15S (joint surfaces) at the inner ends of the left and right legs 9L, 9R are parallel to the left and right side vertical face plates 13L, 13R (joint surfaces) of the central frame section 7 of the center frame 3 and they are flat faces. The joint flange sections 17F, 17B (joint surfaces) at the outer ends of the front and rear leg sections 15F, 15B of the left and right legs 9L, 9R are parallel to the left and right track frames 5L, 5R (joint surfaces) and they are flat faces.

All the joint surfaces are thus flat and parallel so that machining of the weld surfaces can be significantly facilitated and, moreover, high-precision

high-strength weld surfaces can be attained in spite of easy welding.

[0037]

Next, an explanation will be made referring to Figure 8.

According to Figure 8 showing the third embodiment, the left and right side vertical face plates 13L, 13R (joint surfaces) of the central frame section 7A of the center frame 3B are inclined at an angle of θ/2 such that the spacing between the face plates 13L, 13R is long at the front side and short at the rear side, but these face plates are flat faces.

The joint flange sections 15S (joint surfaces) at the inner ends of the left and right legs 9BL, 9BR, which are in contact with and parallel to the above inclined faces, are also flat faces.

In addition, the joint flange sections 17F, 17B (joint surfaces) at the outer ends of the front leg sections 15F and rear leg sections 15B of the left and right legs 9BL, 9BR are parallel to the left and right track frames 5L, 5R (joint surfaces), and they are flat faces.

Although the left and right side vertical face plates 13L, 13R of the central frame section 7A and the joint flange sections 15S at the inner ends of the left and right legs 9BL, 9BR are inclined, their joint surfaces are parallel and flat faces. And, the joint flange sections 17F, 17B at the outer ends of the front and rear leg sections 15F, 15B of the left and right legs 9BL, 9BR are parallel to the left and right track frames 5L, 5R, and they are flat faces.

Accordingly, all the joint surfaces are parallel to their associated joint surfaces and flat, so that machining of the weld surfaces can be markedly facilitated and, moreover, high-precision high-strength weld surfaces can be attained in spite of easy welding.

[0038]

Next, an explanation will be made with reference to Figure 9.

According to Figure 9 showing the fourth embodiment of the invention, the joint flange sections 27a (joint surfaces) at the inner ends of the front left leg 21L, the rear left leg 23L, the front right leg 21R and the rear right leg 23R are parallel to the left and right side vertical face plates 13L, 13R (joint surfaces) of the central frame section 7 of the center frame 3C, and they are flat faces. In addition, the joint flange sections 27b (joint surfaces) at the outer ends of the leg sections 25 of the front left leg 21L, the rear left leg 23L, the front right leg

21R and the rear right leg 23R are parallel to the left and right track frames 5L, 5R (joint surfaces), and they are flat faces.

All the joint surfaces are thus flat and parallel so that machining of the weld surfaces can be significantly facilitated and, moreover, high-precision high-strength weld surfaces can be attained in spite of easy welding.

[0039]

Next, an explanation will be made with reference to Figure 10.

According to Figure 10 showing the fifth embodiment, the joint flange sections 37 (joint surfaces) at the inner ends of the left and right legs 29L, 29R are parallel to the left and right side vertical face plates 13L, 13R (joint surfaces) of the central frame section 7 of the center frame 3D and they are flat. The joint flange sections 37 (joint surfaces) at the outer ends of the front leg sections 31 and rear leg sections 33 of the left and right legs 29L, 29R are parallel to the left and right track frames 5L, 5R (joint surfaces) and they are flat faces.

All the joint surfaces are thus flat and parallel so that machining of the weld surfaces can be significantly facilitated and, moreover, high-precision high-strength weld surfaces can be attained in spite of easy welding.

It should be noted that both of (i) the joint surfaces of the legs and the center frame and (ii) the joint surfaces of the legs and the track frames are not necessarily formed from flat faces, but either pair of joint surfaces (i) or (ii) may be flat faces.

The effect described above can be attained by making both joint surfaces flat or by making either of the joint surfaces flat in each pair ((i) or (ii)) of joint surfaces, so that the number of fitting and assembling processes can be reduced.

[BRIEF DESCRIPTION OF THE DRAWING]

[FIGURE 1]

Figure 1 is an outside perspective view of a crawler frame for a construction machine according to a first embodiment of the invention.

[FIGURE 2]

Figure 2 is a front view of the crawler frame for a construction machine according to the first embodiment of the invention.

[FIGURE 3]

Figure 3 is exploded views of a central frame section of a center frame provided for the crawler frame for a construction machine of the first embodiment of the invention.

[FIGURE 4]

Figure 4 is an outside side view of a leg of the center frame provided for the crawler frame for a construction machine of the first embodiment of the invention.

[FIGURE 5]

Figure 5 is a diagrammatical plan view of the crawler frame for a construction machine according to the first embodiment of the invention.

[FIGURE 6]

Figure 6 is sectional views of various legs which respectively have a tubular shape and a top face of convex cross-section; and sectional views of legs which respectively have a cylindrical pipe shape and a circular cross-section.

[FIGURE 7]

Figure 7 is a diagrammatical plan view of a crawler frame for a construction machine according to a second embodiment of the invention.

[FIGURE 8]

Figure 8 is a diagrammatical plan view of a crawler frame for a construction machine according to a third embodiment of the invention.

[FIGURE 9]

Figure 9 is a diagrammatical plan view of a crawler frame for a construction machine according to a fourth embodiment of the invention.

[FIGURE 10]

Figure 10 is a diagrammatical plan view of a crawler frame for a construction machine according to a fourth embodiment of the invention.

[EXPLANATION OF REFERENCE NUMERALS]

1, 1A, 1B, 1C, 1D ••• crawler frame

3, 3A, 3B, 3C, 3D ••• center frame

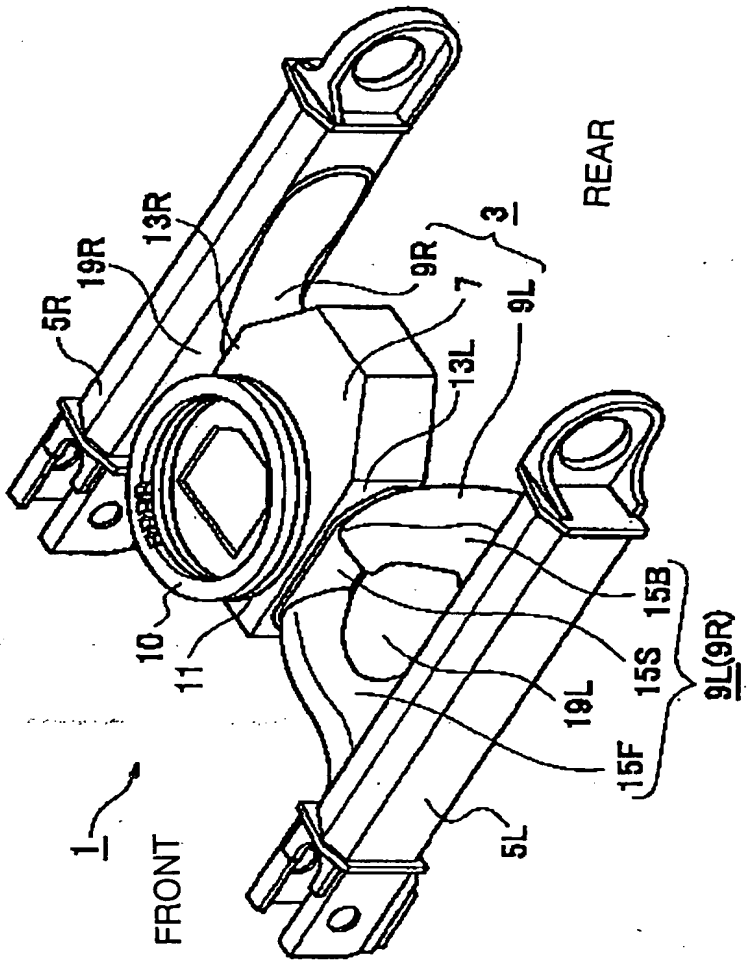
5 ••• track frame

5L ••• left track frame

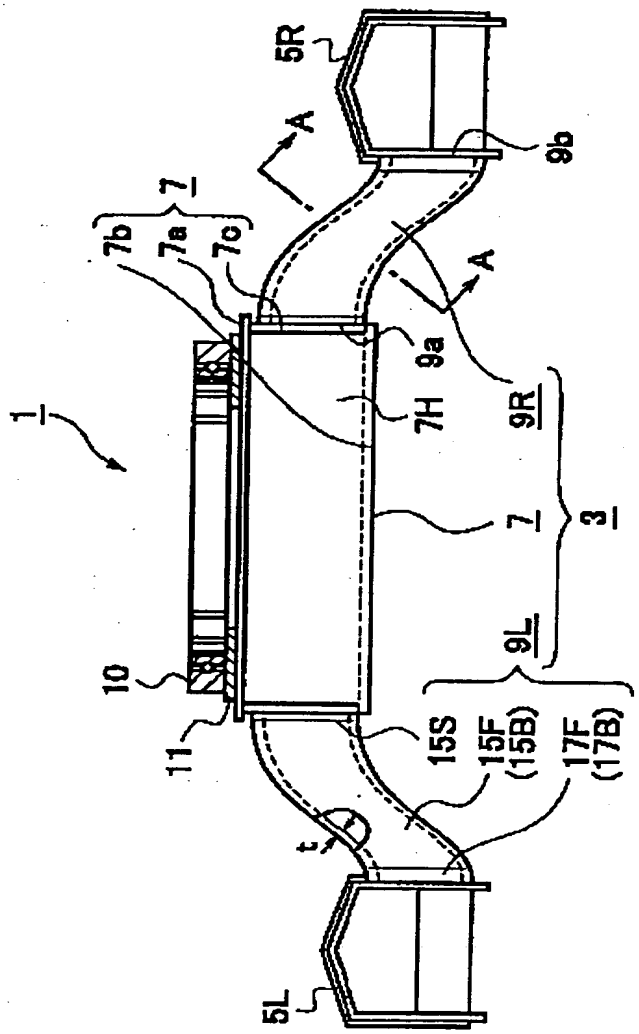
5R ··· right track frame
7, 7A ··· central frame section
9L, 9AL, 9BL, 29L ··· left leg
9R, 29R, 9BR, 29R ··· right leg
9a ··· central frame section side joint surface
9b ··· track frame side joint surface
9d ··· gentle tapered shape
10 ··· swing bearing with a ring gear
11 ··· fixed bedplate
13L ··· left side vertical face plate
13R ··· right side vertical face plate
15F, 31 ··· front leg
15B, 33 ··· rear leg
15S, 27a, 37 ··· joint flange section
17F, 17B, 27b, 38 ··· joint flange section
19L ··· left hole
19R ··· right hole
21L ··· front left leg
23L ··· rear left leg
21R ··· front right leg
23R ··· rear right leg
25 ··· leg section

[NAME OF DOCUMENT] DRAWINGS

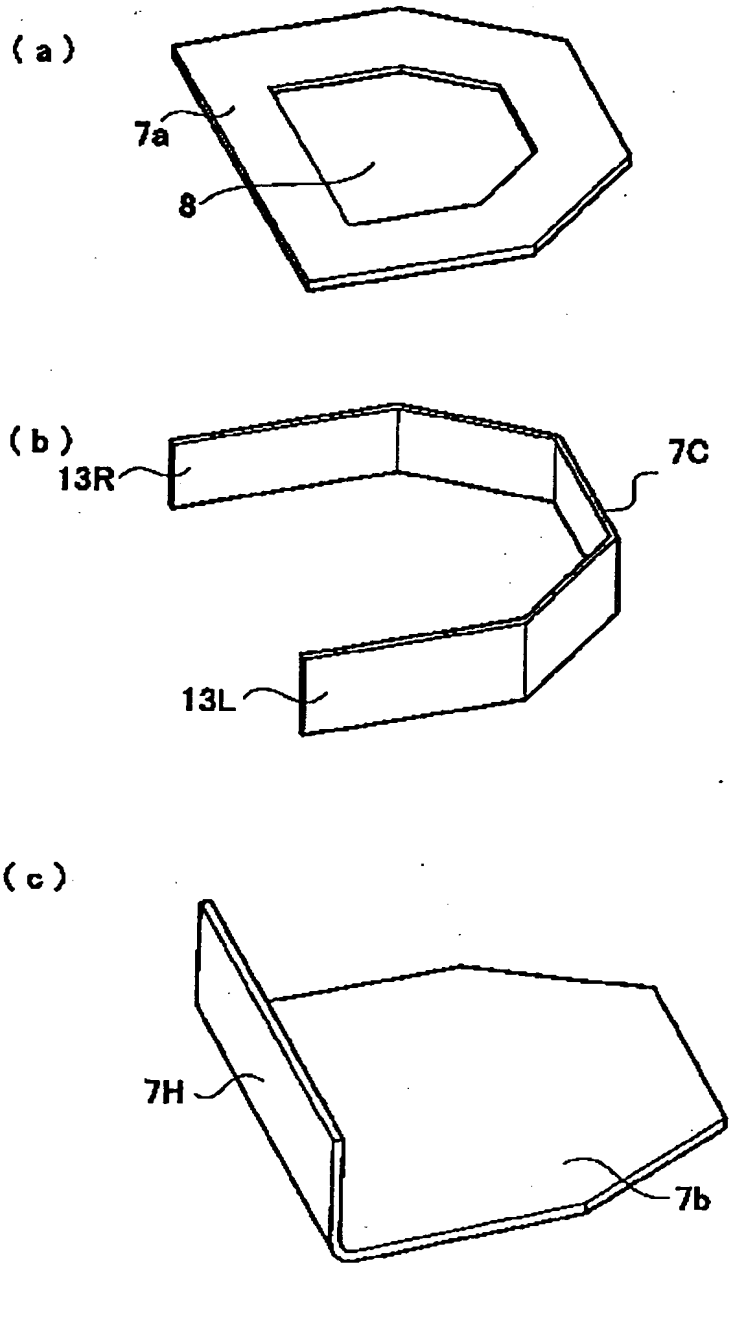
[FIG. 1]



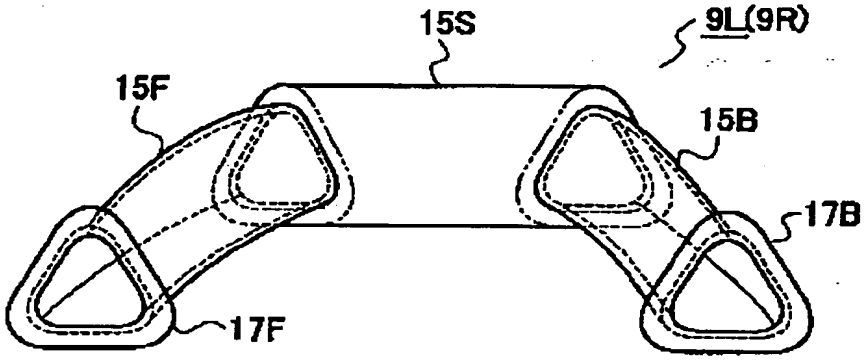
[FIG. 2]



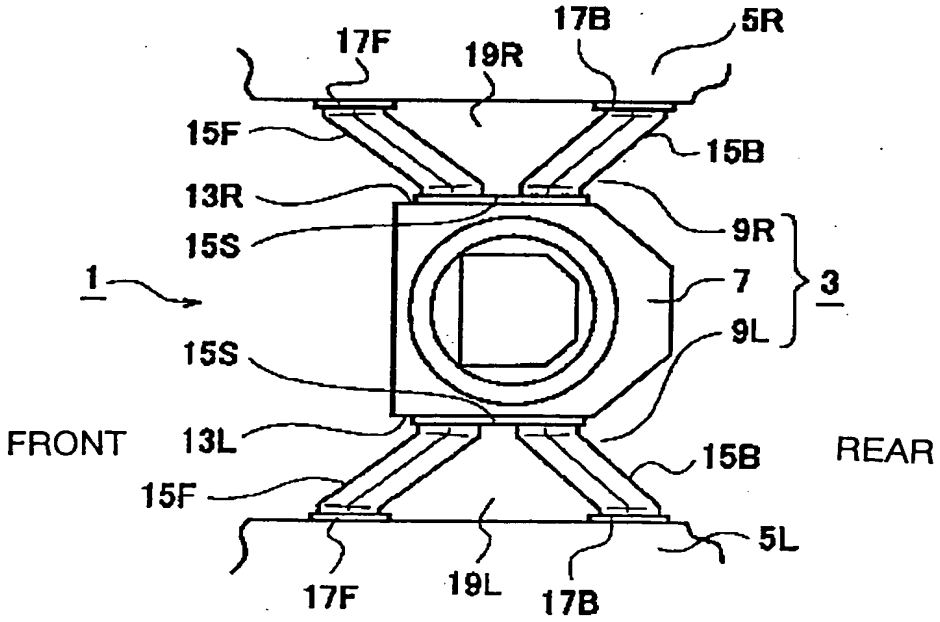
[FIG. 3]



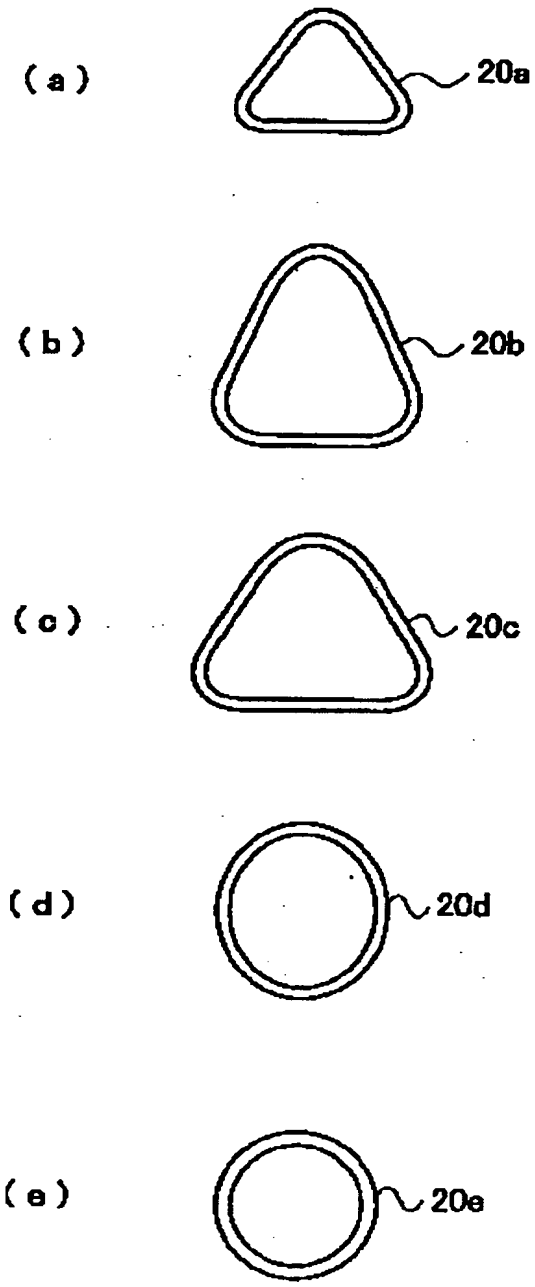
[FIG. 4]


15S
9L(9R)
15F
15B
17B
17F

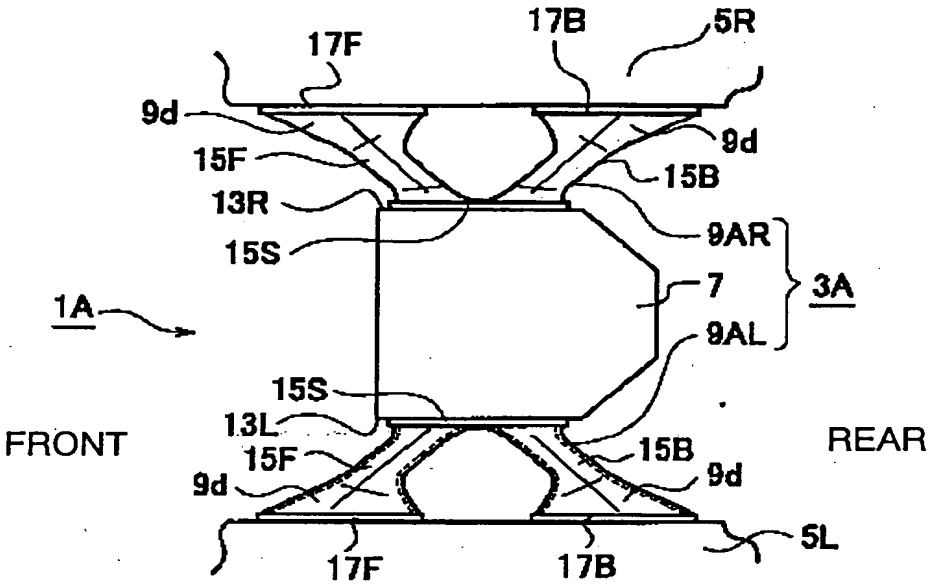
[FIG. 5]


17B
5R
17F
19R
15F
15B
13R
9R
15S
1
7
3
9L
15S
FRONT
13L
15B
REAR
15F
5L
17F
19L
17B

[FIG. 6]



[FIG. 7]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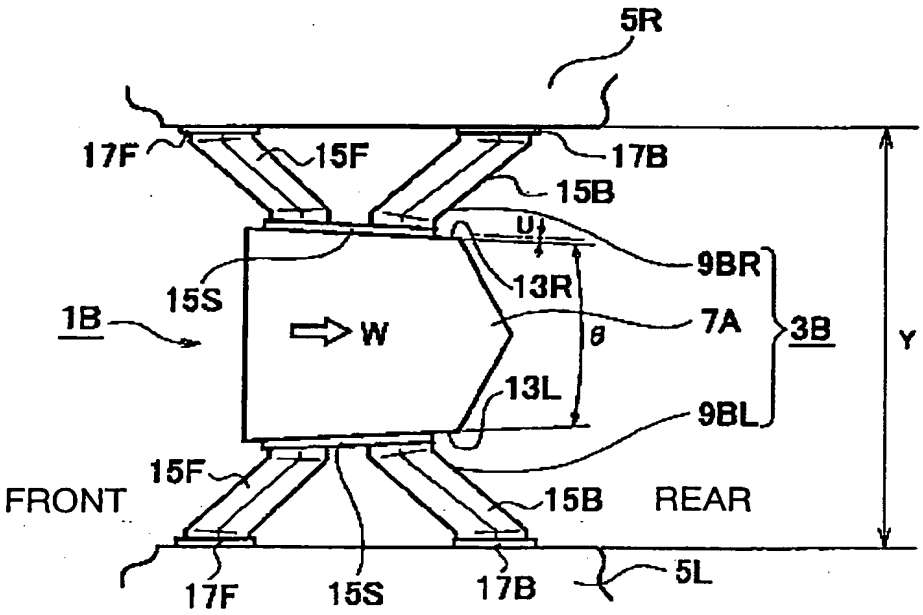
17B
5R
9d
9d
15F
15B
13R
9AR
15S
7
3A
1A
9AL
15S
13L
FRONT
REAR
15F
15B
9d
9d
5L
17F
17B

[FIG. 8]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15F
17B
15B
U
9BR
13R
15S
1B
W
7A
3B
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Y
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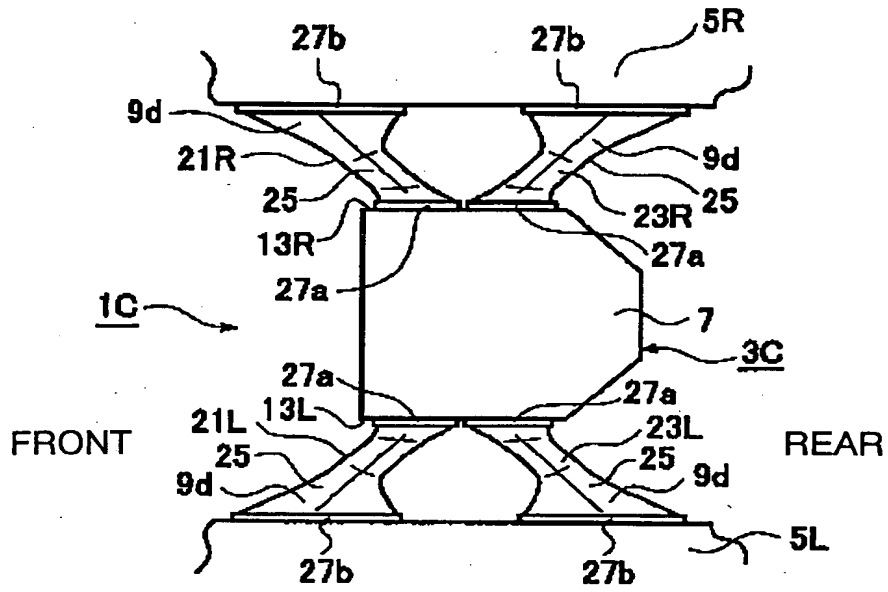
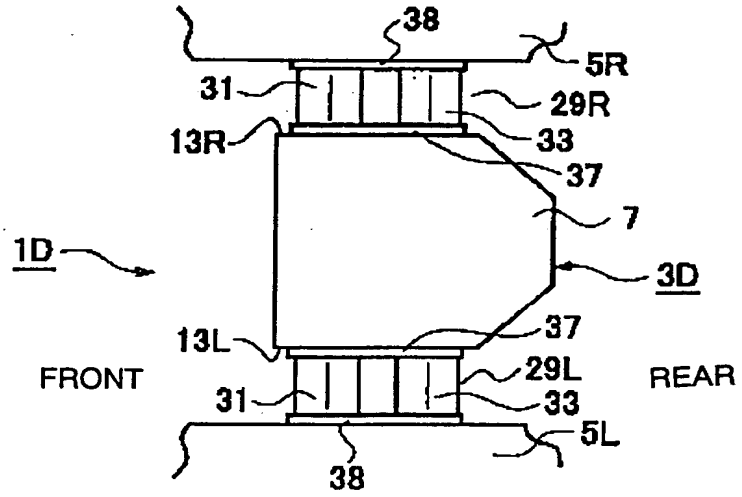
9BL
15F
FRONT
15B
REAR
17F
15S
17B
5L

[FIG. 9]


27b
27b
5R
9d
21R
25
13R
27a
1C
27a
21L
13L
25
9d
FRONT
27b
27b
9d
25
23R
27a
7
3C
27a
23L
25
9d
5L
REAR

[FIG. 10]


38
5R
31
29R
13R
33
37
7
1D
3D
13L
37
FRONT
29L
REAR
31
33
5L
38

[DOCUMENT NAME] Abstract

[ABSTRACT]

[PURPOSE]

There is provided a crawler frame for a construction machine in which legs of a center frame connected to track frames are formed from cast steel so that the manufacture of the crawler frame can be facilitated and the amount of adhering/depositing mud can be reduced to facilitate washing of the crawler frame.

[SOLVING MEANS] The crawler frame for a construction machine has a center frame and left and right track frames which are disposed on the left and right sides of the center frame so as to extend in a back and forth direction. This center frame has legs for connecting the center frame to the track frames and the legs are formed from cast steel.

[EXEMPLARY DRAWING] FIGURE 1